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Development of Test Items for Technical and General English Language with Specific Reference to Knowledge Domain of Bloom's Taxonomy

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Abstract

Taxonomy of educational objectives has always been providing an objective and scientific framework both for setting educational objectives and restructuring test items for evaluation. This paper is an attempt to describe various components of the knowledge domain of Blooms taxonomy and design different test items which could be included in a typical question paper. The test items are based on the explanation of terms provided by Benjamin Blooms and are confined only to the domain of knowledge. The questions are restricted to the course contents of the first year BE engineering students at PSG college of Technology, the researcher's workplace and are pitched at the level of intermediate and advanced learners, who are familiarized with the basic nuances of style, grammar, usage, syntax and other elements of language through the course. The design of questions presuppose that a certain level of mastery in the English language has been attained the learners.

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1. Introduction

One of the most classical and helpful models is the Bloom's Taxonomy of Educational Objectives, which was developed by Benjamin Bloom in the 1950s. Most educational theorists, practitioners, and evaluators have owed a sort of blind allegiance to it for many years now, despite the many doubts that have been raised about both the theoretical and practical implementation of this model. The far-reaching impact of this seminal work has been

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documented by the 93rd yearbook of the National Society for the Study of Education (NSSE), titled Bloom's Taxonomy: A Forty-Year Retrospective, documents the impact of the work:

> "Arguably, one of the most influential educational monographs of the past half century is the Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain. Nearly forty years after its publication in 1956 the volume remains a standard reference for discussions of testing and evaluation, curriculum development, and teaching and teacher education….. At a recent meeting of approximately 200 administrators and teachers, the senior editor of this volume asked for a show of hands in response to the question, "How many of you have heard of Bloom's Taxonomy?" Virtually every hand in the audience was raised. Few education publications have enjoyed such overwhelming recognition for so long" (Anderson & Sosniak, 1994, p. vii)

Cognition involves both comprehension and critical thinking skills, and cognitive domain can be further divided into knowledge, comprehension, Application, Analysis, Synthesis and Evaluation. This codification became the central axis around which language testing developed as well. Language teaching and testing, which aim at fostering critical thinking skills should rightfully accommodate all these divisions in the cognitive domain. Though it is important to address all these domains and design questions from all levels of skills, this paper confines itself to designing questions based on the knowledge component. The questions are based only on the components of syllabus dealing with General English and Technical English papers, which are offered to first-year students at the researchers' workplace. Some of the components of the syllabus taken up for explication in this paper are as follows: aspects of language and vocabulary conventions of a technical report, elements of technical style and so on. The forthcoming paragraph focuses on the knowledge domain as explained by Blooms and presents certain sample questions build around the sub-domains or specifics, as explained by Blooms.

2. Research Methods

Knowledge, as defined by Blooms"... includes ...those behaviors and test situations which emphasize the remembering, either by recognition or recall of ideas, material or phenomena"(p 62,1683). While acknowledging that knowledge is also included in more complex processes, remembering has been singled out by Bloom as one of the major psychological process involved in the process of knowledge acquisition. Blooms further deconstruct or sub-classifies this knowledge domain into the following objectives:

a) Knowledge of specifics
b) Knowledge of terminology
c) Knowledge of specific facts
d) Knowledge of conventions
e) Knowledge of classification and categories
f) Knowledge of methodology
g) Knowledge of principles and generalizations

3. Results and Analysis

Among these objectives, only those pertaining to Language and Technical English have been taken up for explication. As explained by Bloom's knowledge of specifics refer to the" recall of specific and isolatable bits of information" or the "hardcore of facts or information in each field" (63). The references in objectives are large to the most direct and concrete references to items or bits of information obtained/learned. The following are a few questions pertaining to the items in the syllabus that can be included in this category:

1. Select the word or phrase that means almost the same as the word at the head of that group:
1. Espionage
a) Secrecy b) upfront c)society d) forthrightness

2. Select the best connotation of the word " lanky" from the following options:
A) thin b) pleasantly slim c) hungry looking

3. Technical literature can be best described as
a) Conforming to principles of objectivity, clarity, and precision and meant for public consumption
b) Characterized by disregard for conventions
c) Relevant to the general and technical personnel at large

While it is important for a student to recall the meaning of the words given as options in question 1, to attempt questions 2, he must be able to recall his knowledge about connotations in particular, c while still mentally sorting out the frequently heard terms such as the definitions of denotation, connotation and the associated terms like synonyms and antonyms. The learner should be able to recall these specific terms in isolation in addition to recalling the meanings of these terms, which are presumed to be part of either his active or passive vocabulary. Similarly, a knowledge of characteristics/ nature of technical literature would enable him to single out the most appropriate response to the last question in this set.

1. **Knowledge of conventions** refer to the ...usages, styles, practices which are employed in a field and include the following:
   1] Familiarity with the forms and conventions of the major types of works
   2] Awareness of the correct form and usage in speech and writing
   3] Knowledge of ways in which symbols are used to indicate the correct pronunciation of words
   4] Knowledge of acceptable forms of language and rules of punctuation (69-70)

The following questions are some examples to achieve this objective of the knowledge domain:

Directions: Decide which of the following sentences adhere to the conventions of subject-verb agreement

1. **Select** the most appropriate signatory close for a formal letter from the following terms,
Yours lovingly, With Regards, Most affectionately, Yours loyally

2. **Cross check** the terms which would be inappropriate for a formal speech
A) Listen to Lad and Damsels B) Ladies and Gentlemen, May I have your attention, please!

3. **Identify** which sentence in this informal letter violates the norms of tone

Hey, it's great to know that you are a mom now! Congrats!! When I got the news, I was in seventh heaven and just couldn't imagine visualizing you - the bubbly, energetic person spending all your time with bikes and rackets most times back at college - now holding a baby! My dear new mom - watch out for the coming days – your hands are gonna be full with all kinds of stuff around you, buzzing like hell. However, I am extremely sorry to inform you that I am not in a position to attend the ceremony organized to welcome the new baby and please accept my apologies for the same.

4. **Relate the following sentences to the principles of technical writing which have been flouted. One example has given below**
   [1] Water starts jumping and dancing at 100*c – principle of objectivity and conciseness
   [2] I took a 300 ml test tube and heated it...After this, I took great efforts to mount it and clamp the same…the wonderful color of potassium permanganate is always a delight to watch!!!
   [3] Please find enclosed herewith attached a template which has to religiously follow and adhered to at any cost

[4] The chemical composition H2o is as follows: very liberal amounts of Hydrogen and a negligible level of oxygen. Surprisingly, other chemicals are conspicuously absent!!!
[5] Revise the following statements which have violated the principles of punctuation
[1] I love cooking my family and my pets
[2] Let's eat Grandpa

The first question requires that the student is able to recall the various phrases used for complimentary close in a letter in various contexts, ie he has to recall the context and the phrases used and decide which one flouts the norms. Along the same lines, to attend the second and third questions, the candidate must be able to recall the usage of tone and the kinds of words which characterize that particular. It is also important for him to recall the conventions of register and its implications in formal and informal contexts.

2. Knowledge of classification and categories:

This category encompasses the "ability of learners to recognize the area encompassed by various kinds of problems and materials, and becoming familiar with a range of types of literature" (p 72). A third year engineering student is assumed to have some understanding of the genre of technical, semi-technical and popular science articles, given his limited exposure to reading popular science articles in Sunday news supplements or health alert blogs. Further, at this level, he would have also been accustomed to reading and understanding different types of technical genres such as instructions, descriptions, reports, proposals and so on. The following questions are illustrative of testing knowledge of classification and categories:

1. Decide which of the following paragraphs would be classified as parts of popular science, scientific and a semi-technical article

1. There is a menace in our supermarkets. And it is nothing short of a dietary WMD: A Weapon of Mass Diarrhea.
   Its name is gluten.
   Gluten is a mixture of proteins found mostly in wheat, but also in barley, rye, and oats. These grains make up many of our bread, pasta, granolas, noodles, tortillas, and beers. That's trouble for several million Americans (about one percent of us) who suffer from celiac disease, an autoimmune disorder in which gluten causes the body to attack the small intestine. Several million more people (up to five percent of the population) suffer from "non-celiac wheat sensitivity," in which gluten triggers celiac-like symptoms—such as stomachaches, diarrhea, and depression.
   (http://www.popsci.com/what-is-gluten#page-2)
2. A new study that analyzed the toxic components of proteins in various varieties of wheat has made the first step forward towards developing wheat-based products that are safe for celiacs.
   Celiac disease, one of the most common autoimmune diseases, causes atrophy in the villus of the intestinal mucosa, which leads not only to poor nutrient absorption but also malnutrition, diarrhea, stunted growth, anemia, and fatigue. In recent years research that seeks to understand the relationship between the proteins of wheat gluten and the reaction it produces in celiacs has been promoted. One of the hypotheses, with no clear scientific basis, was that modern wheat production practices that aim to improve the viscoelasticity of bread dough had contributed to increasing the prevalence of celiac disease since the late 20th century…
3. Decide which of the following sentences will not be a part of technical literature
   1. Maiden concrete, how shapely are thy limbs .....
   2. Concrete is composed of
   3. Instability and unpredictability – thy name is Mercury! How easily do you flow from one to the other like a slippery eel on a well-oiled surface ...How swift elastic is thy leap!
4. A thermostat simply switches the heating system on and off as necessary. It works by sensing the air temperature, switching on the heating when the air temperature falls below the thermostat setting and switching it off once this set temperature has been reached. Turning a room thermostat to a higher setting will not make the room heat up any faster. How quickly the room heats up depends on the design of the heating system, for example, the size of boiler and radiators.

A) 1 and 3 b)2 and 3 2 c) 1 and 2 d) 3 and 4

5. Excerpts from various genres of technical writing are given under column A. Label them as belonging to a) part of instructions, b) report c) proposal.

Extract 1
Start the engine and run it to idling speed
Open the radiator cap and insert the measuring gauge
Note whether the red ball within the glass tube floats either to the acceptable green range or top the dangerous red line

Extract 2
I propose to review the available literature about using Yucca Mountain as a possible repository for spent nuclear fuel. In this review I will achieve the following two goals:
(1) Explain the criteria for a suitable repository of high-level radioactive waste; and
(2) Determine whether Yucca Mountain meets these criteria.
According to the Department of Energy (DOE), a repository for high-level radioactive waste must meet several criteria including safety, location, and economics [Roush, 1995]. Safety includes not only the effect of the repository on people near the site but also people along the transportation routes to the site. In my research, I will consider both groups of people. As far as location, a waste site cannot be in an area with a large population or near a groundwater supply
Source:
http://www.writing.engr.psu.edu/workbooks/proposal.samples.html

Extract 3
1. Utility/system voltage levels were found to be imbalanced during the monitoring period (approximately 4.7%). MEC recommends a review of the electrical service voltage levels with the utility to determine if the voltage imbalance is caused by service entrance equipment (transformer(s), cabling, connectors, etc.) or utility distribution (grid) system voltage deviation caused perhaps by loading or other issues.
2. Compressor(s) motor currents (amps) were found to be severely imbalanced at the main disconnect panel. Investigation of the electrical service voltage levels is recommended...

Source:
idwestelectrical.com/_resources/pdfs/mec_sample_engineering_report.pdf

While the applications of the principles and objectives have definitely strengthened educational practices, the taxonomy is not without its flaws. In the first place, measuring cognition does not take into account the underlying metacognitive process that triggers the cognitive process. Also, as acknowledged by Blooms himself and his followers, any taxonomy is a manufactured one and could be arbitrary in nature. Further, measuring or assigning such intangible process as learning, teaching and thinking can only be far from perfect. However, the support this framework provides about thinking about thinking and the understanding it leads to the essential properties underlying each phenomenon has been helping in evolving more structured and balanced framework for testing

4. Conclusion

A proper understanding of the knowledge component of Bloom's taxonomy can thus provide a field for generating different kinds of questions for any paper. Exploring other domains of thinking such as application, synthesis, comprehension and evaluation would help in generating richer sets of questions and more meaningful test items which are both balanced, challenging and catering to both higher and lower order levels of thinking. These could be possible avenues of future research.

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